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ABSTRACT

This study was designed to compare both levels of performance and relationships between performances on cognitive tests in groups of children and adolescents in Canada and the Philippines with similar educational experience. A battery of eighteen tests, including the Ravens Progressive Matrices (1958), the Science Research Associates Primary Mental Abilities Tests, and selected tests from the Educational Testing Service kit, was used. The samples included 219 students from an urban center in Ontario, boys and girls in grades six and eight; from private, public, and Catholic schools, and 203 students in Manila from similar sources. The results demonstrate the existence of two general factors of intellectual functioning, one concerned with conceptual or relational thinking, and the other with forming associations. The Canadian subjects were superior on the former, and the Filipino students were superior on the latter. (author/SK)

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SOME DIFFERENCES IN COGNITIVE ABILITIES BETWEEN CANADIAN AND FILIPINO STUDENTS

by

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1. Introduction and Background

This paper describes part of a study whose aim was to determine some useful classifications of individual differences in cognitive abilities for Filipino students. The strategy followed was to choose as a reference group in the Philippines children attending school at the grades 6 and 8 levels in Manila. While such a population cannot be considered as representative of Filipino children in the age group, it is identifiable, and other groups can be compared with this population at a later date.

In order to help interpret the Filipino data, a group of Canadian children was used. Patterns of individual difference in the latter group would probably be more typical of those reported in the English language literature. Any major differences in factor structures or the profiles of mean performances on the various tasks could be taken as an indication for further research.

A variety of studies has been concerned with comparison of patterns of individual differences in different ethnic, racial, and cultural groups. Studies such as those of Vernon (1965a and 1967), relying on factor

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analyses of test batteries,often reveal the same basic factor variables in quite diverse groups, for example, English, West Indian, and Eskimo, but indicate some quite large differences both in the correlation of the particular tests with the factor variables, and in the relative profiles of mean performances on the tests. Yet other studies, e.g. McArthur (1966) provide evidence of differences in factor structure, particularly in terms of the extent of differentiation of cognitive traits.

Vandenberg (1959, 1967) made use of Ahmavaara's (1957) technique for transforming the factor structure of one study to maximum similarity with that of another. He compared data for Chinese students at American Universities with those obtained by Thurstone (1938) for American students. When Ahmavaara's technique was used, the factors common to both groups were identified as spatial, verbal, numerical, memory, and perceptual speed. The same technique was used eight years later to compare the factor structure on the same tests for a group of South American students temporarily in the U.S.A. with the original structure for the Chinese students. The factors matched in both groups were named spatial, verbal (English), number ability, memory, and perceptual speed. There was also some agreement on a poorly defined reasoning factor. Vandenberg's work shows the usefulness of this type of comparison technique.

Guthrie (1963) performed a correlational study with 314 women college students in the Phillipines, using both English language and Philippine language (Talalog) tests, although he had no comparison group elsewhere. The factors he identified included visualization, verbal, numerical, rote memory, word fluency, and speed factors, as well as a Tagalog verbal factor.

The present study differed from Guthrie's in that it was concerned with school children, and a Canadian comparison group was used. In the event that the structures from each group were sufficiently similar, as was the case, it was planned to follow the first separate analyses with an alternative one allowing comparison of means of factor scores derived from a single factor analysis of the pooled data of both samples. The profiles of the mean factor scores in the various groups could then be compared.

A hierarchical view of cognitive abilities was seen as most useful in classifying cognitive traits (see, for example, Humphreys, 1962) and tests for the study were chosen so as to sample quite general traits as well as more specific ones. Jensen's (1969) distinction between Level I intelligence (associative) and Level II intelligence (conceptual) also prompted the inclusion of tests which might be regarded as sampling behaviors from these two broad types.

2. Procedure

Subjects were chosen from grades 6 and 8 in each of private, catholic, and public schools in Manila, and Oshawa, Ontario. In general,

there was one intact class in one or two schools of each type at each grade level, but there were no grade 6 subjects from private schools in either city. The classes were sampled with the cooperation of the education authorities who were asked to choose what they regarded as typical groups. In addition 67% of the children in the grade 6 Filipino sample were drawn from the selective University Training School. This was necessary to ensure that children at this age level would be quite familiar with the English language tests used in this study, since, of public school children, only those taught at the University school had been instructed in English from kindergarten on. The others were taught in the vernacular until Grade 3. Education at the Grade 8 level is not free,and there is obviously economic selection at this level also. By contrast, the Canadian sample would be expected to be much more typical of Ontario urban children. The numbers and average ages of children used in each sample were Grade 6 Canadian, 117/11-6, Grade 6 Filipino, 94/12-4, Grade 8 Canadian, 102/13-7, and Grade 8 Filipino, 109/14-8.

It is necessary to emphasize that the type of sampling used in this small study does not allow comparisons of cultures, which would require an extensive sampling effort. It may allow the formation of some useful hypotheses. Since the curricula for the corresponding grades were similar, and the samples were equated on educational experience, one important variable has been controlled. Data on occupation and

education of parents, determined from responses to a questionnaire given at the time of testing, are provided in Tables 1 and 2.

The tests used were the Primary Mental Abilities Tests (PMA, 1962) for the grades 6-9 level, and selected tests from the Educational Testing Service Kit of Reference Tests for Cognitive Abilities (ETS, 1963), together with the 1958 version of Raven's Progressive Matrices. A fuller description follows.

Verbal Comprehension: Test 1, Verbal Meaning (PMA) and Test 2, Vocabulary (ETS) each present multiple choice items for synonyms of the test words.

Word Fluency: Test 3, Word Endings (ETS) and Test 4, Word Beginnings (ETS) represent well known types of tests in which the respondent is asked to think of as many words as possible with the given beginning and ending.

Spatial Facility: Test 5, Spatial Relations (PMA), and Test 6, Card Rotation (ETS) require the subjects to discriminate between figures which have been merely rotated from those which have been both rotated and turned over. Test 8, Maze Training (ETS) requires the subject to find and work an open path through a moderately complex series of mazes. This test might also be regarded as one of perceptual speed.

Perceptual Speed: Test 7, Identical Pictures (ETS), requires the choice from five alternatives of a diagram identical with a given

diagram, and Test 9, Finding A's (ETS) requires the subject to mark all words containing the letter a.

Arithmetic: Test 10, Number Facility (PMA) is called Arithmetic in this battery. It requires working with numbers and the handling of simple quantitative problems rapidly and accurately. Tests of this kind usually have a high correlation with reasoning tests beyond the very early grades and should be distinguished from tests like those in the next group.

Numerical Facility: Test 11, subtraction and multiplication (ETS) and Test 12, Division (ETS) are speeded tests in simple mechanical arithmetical operations and algorithms, for example,

$$\begin{array}{r} 98 \\ -75 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 86 \\ \times\ 6 \\ \hline \\ \hline \end{array} \qquad \text{or} \qquad \begin{array}{r} 238 \\ \div\ 7 \\ \hline \\ \hline \end{array}$$

Reasoning: Test 13, Letter series (PMA), Test 15, Number series (PMA), Test 14, Word grouping (PMA),a classification test, and Test 16, Raven's Progressive Matrices,are all well known measures of reasoning ability. The type of process involved may be regarded as inferring a rule and applying this rule to another object. In the case of the word grouping test the rule must be reapplied to the words from which it was inferred.

Associative Memory: Test 17, Picture-Number (ETS) and Test 18, Object-Number (ETS) are both measures of the ability to learn paired associates and to recall them. In test 17 a picture must be associated with a number, and in test 18 a noun, the name of an object, must be associated with a number.

Correlations among the 18 tests for the separate grade x culture groups as well as for the pooled data from both grades and both countries were determined. The five intercorrelation matrices were used as the basis of factor analyses described in the next section. Mean scores and standard deviations were also computed for each grade sample in each country.

3. Results

For reasons explained earlier, the main interest is in the results of the Filipino sample, and a comparison between means in the samples from the two cities is not proper. It is, however, of some interest to compare the profiles of the mean scores on the 18 tests. Table 3 presents such comparisons. The select nature of the Filipino grade 6 group is evident if its results are compared with the Filipino grade 8 means. A more convenient way of considering the mean profiles for each Filipino group is to take the corresponding Canadian group as a standard and to compute corresponding t-values for the differences between means. There does not seem to be much point in attaching probabilities to these t-values since the populations being compared are not clear, and in any case a multivariate analysis is more appropriate.

The t-values do, however, serve to adjust the metrics of the different tests so that they are comparable. If the profile of t-values is now centered by subtracting the mean t-value, the resulting numbers give a good indication of the relative strengths and weaknesses within each Filipino group compared with the pattern of performances of the Canadian group. The graphs of the profile of relative means for the grades 6 and 8 Filipino groups are presented in Figure 1. They show a very close similarity. Compared with the relative performances of the Canadian groups on the various tests, the Filipino students in both grades 6 and 8 performed relatively better on tests 4, Word beginnings, 7, Identical Pictures, 8, Maze tracing, 9, Finding A's, 11, Subtraction and multiplication, and 12, Division, than they did on tests 2, vocabulary (ETS), 5, Spatial relationships, 6, Card rotations, 10, Arithmetic, 13, Letter series, 14, Word grouping, 15, Number series and 16, Raven's PM.

The relative difference between tests 1 and 2, which are both essentially synonyms tests, for the Filipino children is difficult to explain, as is the relative difference between tests 3 and 4, both fluency tests, word endings and word beginnings. Otherwise the peaks in the profiles of relative differences correspond very closely to the pre-assigned factorial groupings of the tests.

The results of the factor analyses are shown in Tables 4, 5, and 6. The matrix of correlation coefficients for the eighteen tests resulting from the pooled data for all four samples was factor-analysed

first by the principal factor procedure (see Harman 1967, P135). An oblique PROMAX factor solution was then found (see Hendrickson and White, 1964) producing six correlated factors. The factor inter-correlations were further analysed to produce two uncorrelated second order factors. A Schmid-Leiman transformation (Schmid and Leiman, 1957) then produced the matrix of Table 4. In this matrix, Factors 1 and 2 represent factor variables which are general to two or more of the original primary factors. Factors 3 to 8 of Table 4 represent variables which are specific to the original primary factors after the variance contributions of the two general factors have been removed. All eight factor variables referred to in Table 4 are uncorrelated.

The first factor has been named Relational Thinking (R). It is defined principally by the four reasoning tests all of which involve seeing and using relationships, and Tests 5 and 6, both of which involve seeing spatial relations. The Arithmetic test is also correlated with this factor, in agreement with Guilford's (1960) use of an arithmetic test not involving computations to measure general reasoning. The vocabulary test from the ETS Kit also has a high loading.

The second general factor is defined by the two tests of numerical facility (tests 11 and 12) and by the tests chosen to measure perceptual speed (Identical pictures and Finding A's). In addition, Test 8, Maze tracing, which appears to have a perceptual speed component, and the PMA Verbal Meaning test and the ETS Word Beginnings test are substantially

correlated. The Object-number associative memory test also has a moderate loading.

Factor 2 may represent an automated learning variable, defining individual differences in processes that are susceptible to a high degree of automatization. This type of process clearly characterizes the elementary arithmetic operations, which are usually drilled. Simple clerical tasks such as checking A's or matching diagrams may also involve a quickly learnt automated response. Alternatively, the factor may arise from differences in a perceptual process, the high availability of the number responses making the numerical tasks and the clerical matching tasks similar. The factor may be also compared with Jensen's (1969) level I abilities of which he says: "There is relatively little transformation of the input, so that there is a high correspondence between the forms of the stimulus input and the forms of the response output. Level I ability is tapped mostly by tests such as digit memory, serial rote learning, selective trial and error learning with reinforcement (feedback) for correct responses, and in a slightly less "pure" form by free recall of visually or verbally presented materials, and paired associate learnings". (p.111) If one grants that arithmetic facts and word meanings may be learnt by these rote processes, it is not hard to reconcile Factor 2 with such abilities as Jensen describes, and the Factor is tentatively named Associative Learning (A).

Most of the other factors are readily named as residuals from the corresponding primary abilities. There is no fluency factor, but

verbal comprehension (V), spatial facility (S), numerical facility (N), and memory (M) factors are easily identified. Factor 7, ordering (O), is defined by the two series tests, and presumably reflects the seriation rather than the reasoning aspects of those tests

Factor 8 is a very weak residual from what was a perceptual speed factor in the oblique primary factor solution. This primary factor is however almost totally accounted for by the Associative Learning Factor,2, and factor 8 of the Schmid-Leiman system can be ignored.

Using the pooled data from both the Canadian and Filipino samples is likely to produce factors which accentuate the difference between the various groups. It is therefore important to verify that similar factor structures exist in each of the four groups when data from each group are analysed separately. Such an analysis was performed for each sample, and the resulting factor matrices transformed in such a way that they were maximally congruent with the hierarchical matrix of Table 5, which was used as a target matrix. This procedure is similar to that used by Vandenberg, except that a method due to Cliff (1966) was used for the transformations. Coefficients of congruence (see Tucker, 1951) were calculated to show how well factors from the separate groups matched corresponding factors in the target matrix.

The results in Tables 5 and 6 indicate that a satisfactory degree of similarity exists between the factor matrix for each group and the target matrix. The match with factor 8 is in all cases low,

but this was to be expected. For the factors which have been named, the lowest coefficients of congruence are .70, .76 and .72, in each case for the numerical factor. However, examinations of the coefficients leave no doubt that in each case the same factor is involved. It seems reasonable to retain the same factor names and interpretations for the factor variables of the separate groups.

In spite of the over-all factorial similarity, not all tests show quite the same factorial composition in each group. Some of the differences occur between grade levels and are present in both the Canadian and Filipino groups. Other tests differ in their factorial composition between the Canadian and Filipino groups at one age level. The least consistent patterns of loadings occur with the Maze Tracing and Finding A's tests. The arithmetic test loads on the number factor in the Canadian Grade 6 group, but not in other groups. The Word Grouping, Letter Series, and Number Series tests load substantially on the Associative Factor for the Grade 6 Filipino groups but much less or not at all in the other three groups.

In general, there is good agreement between all four groups on the factorial structure of the test battery. This being so, it seems reasonable to accept the hierarchical solution of Table 1 as a general description of the factor structure in all groups and to use it to estimate factor scores. It is thus possible to compare the means of these estimates in the four groups. More importantly, it is

possible to make the same comparison of mean factor profiles as was made with mean test profiles.

The factor scores were estimated by means of Thurstone's regression method (see Harman 1967, p.350 ff). Although this method has some disadvantages (McDonald and Burr, 1967), it is the most convenient to use with the kind of factor matrix used here. The means and standard deviations of these estimates are given in Table 7. Means which are significantly different in the two samples at each grade level are marked, but the same caution concerning generalization applies here as with the test scores. When the Filipino profiles are made relative to the complete Canadian profile, as with the test scores,the relationships shown in Figure 2 result. When the Canadian samples are used as a reference group, both the Grade 6 and Grade 8 Filipino samples appear to perform better on the tasks represented by the Associative and Numerical Facility factors than they do on the Reasoning, Verbal, Spatial, Memory, and Order factors.

4. Conclusion

While it is impossible to forecast the result of making similar comparisons to those made above using other types of tests, there is a strong indication that as far as the factor variables sampled are concerned, Filipino school children exhibit much the same kinds of individual differences as do Canadians.

The traits of most generality which the study suggests are those of relational and associative thinking. In addition to these,

more specific traits, particularly verbal comprehension, numerical facility, spatial facility, and associative memory, appear to offer stable classifications of cognitive behaviors. To the extent that these traits are being found useful for prediction, educational and vocational guidance and placement, and catering educationally for individual differences in ability in Canada and other western countries, so they might be expected to be useful with children like those studied in Manila. Further research is needed to know to what extent other Filipino children are like those in Manila.

The second kind of result was concerned with mean performances of the various groups. If the children in each Canadian sample are supposed to be, on the average, equally proficient on all tests, it is evident that the Filipino children are not. The same result also applies to factors. We could of course turn the result the other way around, and suppose the Filipino group to be equally proficient on all tests. Then the Canadian children would not be. However we view the result, there is no doubt that the abilities represented by the factors interact with methods of instruction used in schools.

The similarity between Grade 6 and Grade 8 in the profiles of relative mean scores is of interest. While the Canadian children at each grade level were drawn from roughly similar groups, according to the data in Tables 1 and 2, the occupational and educational level of the parents of the Grade 8 Filipino children were quite different from

those of the Grade 6 children, even though both groups were relatively select. The result parallels the findings of Lesser, Fifer, and Clark (1965) and Stodolsky and Lesser (1967), who found similar invariance of mean profiles across even more disparate class groups within given ethnic groups, even though the differences in profile between ethnic groups were large.

An attempt at associating test performance with environmental variables was made in conjunction with the present study and will be reported elsewhere. The results of this attempt were mainly negative. It is likely that environmental and cultural effects on patterns of performance will only be understood by prolonged observations of the kinds of performance which are modelled, shaped, and reinforced in the school, the home, and other important groups.

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TABLE I

Distribution of Father's (or Guardian's) Occupations

Grade	Sample	Categories* I	2	3	4	5	6	T
6	Canadian	11	14	1	15	74	2	117
	%	9.4	12.0	0.9	12.8	63.2	1.7	100.0%
	Filipino	52	26	5	9	2	0	94
	%	55.3	27.7	5.3	9.6	2.1	0.0	100.0%
8	Canadian	12	24	7	16	41	2	102
	%	11.8	23.5	6.9	15.7	40.1	2.0	100.0%
	Filipino	28	7	9	31	34	0	109
	%	25.7	6.4	8.3	28.4	31.2	0.0	100.0%

* 1. Professional (Doctor, Lawyer, Engineer, etc.).

2. Executive (Manager for large business, industry, department).

3. Owns, rents, or manages small farm or business.

4. Office work (Cashier, clerk, secretary, book-keeper), Salesman (Insurance, real estate, auto, etc.).

5. Semi-skilled (Plumber, barber, carpenter, electrician), Unskilled (Factory worker, labourer, janitor).

TABLE 2

Distribution of Parents' (or Guardian's) Education (%)

Grade	Sample	Parent	Categories* 1	2	3	4	5	6
6	Canadian	Father (or G)	14.5	7.8	28.2	23.9	18.8	6.8
		Mother	9.4	6.8	33.3	29.9	14.5	6.0
	Filipino	Father (or G)	77.7	6.4	7.4	5.3	3.2	0.0
		Mother	76.6	11.7	5.3	4.3	2.2	0.0
8	Canadian	Father (or G)	19.6	9.8	20.6	23.6	15.7	10.8
		Mother	17.6	10.8	26.5	19.6	15.7	9.9
	Filipino	Father (or G)	34.0	26.6	19.2	13.8	6.4	0.0
		Mother	20.2	20.2	23.9	22.0	13.8	0.0

* 1. Received university degree.

2. Attended university but did not receive degree.

3. Completed secondary school but did not attend university.

4. Entered but did not complete secondary school.

5. Did not attend secondary school.

6. Not known or deceased.

TABLE 3

Means and Standard Deviations of Test Scores

	Grade 6					Grade 8				
	Means			S. D.		Means			S. D.	
Test	C	F	t-value	C	F	C	F	t-value	C	F
1	16.9	28.0	+ 9.8	4.92	9.99	25.9	23.2	- 2.9	6.36	7.14
2	13.4	13.5	+ 0.1	5.24	5.53	21.8	11.6	-15.0	4.97	4.84
3	11.6	12.4	+ 1.6	3.74	3.39	13.6	10.6	- 4.8	4.18	4.87
4	5.5	12.1	+13.1	2.82	4.17	9.9	11.5	+ 2.6	4.42	4.62
5	18.5	15.0	- 1.9	11.26	14.16	25.9	12.9	- 6.8	14.96	12.43
6	52.3	44.8	- 2.0	23.18	29.37	65.8	37.4	- 7.9	24.21	27.64
7	27.3	41.2	+16.8	6.15	5.80	34.2	39.4	+ 4.7	6.89	8.90
8	6.5	9.9	+ 6.9	2.60	4.14	9.3	9.4	+ 0.2	3.20	4.83
9	15.7	34.0	+19.0	4.37	8.43	20.4	28.0	+ 7.1	5.87	9.26
10	12.4	10.8	- 2.8	3.88	4.32	16.8	10.2	-11.7	4.58	3.42
11	32.8	62.5	+11.8	12.77	21.49	41.1	55.9	+ 5.3	11.97	26.36
12	8.7	39.5	+14.2	6.26	20.11	20.6	23.2	+ 1.2	10.37	19.65
13	8.0	9.9	+ 3.4	3.44	4.42	11.3	6.2	-10.0	3.42	3.96
14	16.5	13.8	- 5.1	3.50	4.02	20.1	12.9	-15.0	3.43	3.50
15	7.6	8.1	+ 1.4	2.16	2.98	9.2	7.2	- 5.4.	2.72	2.59
16	36.4	36.2	- 0.2	8.06	7.51	40.7	32.1	- 6.9	8.04	9.86
17	6.3	7.7	+ 2.7	3.58	3.86	9.4	7.6	- 2.6	4.97	5.07
18	3.3	4.8	+ 4.5	2.51	2.33	5.6	5.8	+ 0.4	3.53	2.95

TABLE 4

Hierarchical Factor Matrix* for Grades 6 and 8 Combined, Based on Pooled Canadian and Filipino Data

Tests		Factor R 1	A 2	V 3	S 4	N 5	M 6	O 7	8	h^2
1. Verbal Meaning	V	31	56	41	-08	08	-10	-05	18	64
2. Vocabulary	V	60	10	56	01	-04	-04	-07	-06	69
3. Word Ending	F	37	26	23	-02	03	16	01	00	28
4. Word Beginning	F	08	56	17	-11	05	12	-04	22	43
5. Spatial Rel.	Sp	64	02	01	58	03	00	-04	01	75
6. Card Rotation	Sp	62	03	02	58	05	01	-08	-01	72
7. Identi.Pictures	P	00	66	-09	-01	-05	02	08	08	42
8. Maze Tracing	P,Sp	21	36	-05	25	-07	-04	00	33	35
9. Finding A's	P	-16	62	-08	-06	13	07	-01	28	52
10. Arithmetic	N,R	65	10	26	13	05	06	11	-11	55
11. Subtn.Multn.	N	-04	68	-06	06	56	04	-02	-06	79
12. Division	N	06	66	01	04	42	-10	04	07	64
13. Letter Series	R	59	00	-04	-10	-10	-05	59	08	75
14. Word Grouping	R	65	-04	35	07	-09	-04	10	-08	58
15. Number Series	R	51	18	-04	01	08	07	38	-02	45
16. Raven's P.M.	R	57	14	13	15	-08	01	17	09	43
17. Pict.-Number	M	21	19	00	03	-05	50	-03	01	34
18. Object-Number	M	14	32	-07	00	02	61	-01	02	50
% Variance		18.4	15.5	4.5	4.6	3.1	3.9	3.2	1.8	54.6

* Decimal Points have been omitted.

TABLE 5

Factor Matrices for Grade 6 Rotated to Match Target Matrix

		Grade 6 Canadian									Grade 6 Filipino								
		R	A	V	S	N	M	O			R	A	V	S	N	M	O	P	
Test		1	2	3	4	5	6	7	8	h^2	1	2	3	4	5	6	7	8	h^2
1. Verbal Mean	V	47	15	57	-07	00	-15	-07	00	61	50	17	56	-07	-14	02	-10	03	62
2. Vocabulary	V	47	08	65	00	01	-20	-18	-02	72	43	07	65	-15	-05	10	-18	-07	69
3. Word End	F	10	46	28	-22	-04	23	-08	09	42	28	47	24	27	18	-04	-23	12	53
4. Word Beg.	F	12	63	28	-12	-30	08	-12	34	73	29	37	22	12	04	-11	-06	13	32
5. Spatial Rel.	Sp	60	17	-05	57	-11	07	-03	15	75	71	07	00	58	07	10	-01	01	87
6. Card Rot.	Sp	48	16	-02	63	-04	-05	-16	16	71	69	06	00	46	07	10	09	-01	70
7. Ident. Picture	P	17	24	-11	04	-09	02	17	14	16	-02	51	-17	-10	-42	16	16	34	65
8. Maze Tracing	Sp	40	03	05	34	18	-38	08	01	46	14	29	-13	35	-14	-09	-07	25	34
9. Finding A's	P	09	31	-09	18	19	-17	06	08	22	05	19	-01	35	-03	24	28	-03	29
10. Arithmetic	N,R	52	47	07	13	39	14	19	-08	73	66	25	29	05	20	10	16	-09	66
11. Subtn.Multn.	N	04	43	03	02	52	10	-01	-13	49	32	51	-06	17	56	20	17	-06	74
12. Division	N	26	27	00	26	41	01	-02	-06	44	16	50	-04	02	50	-11	19	-03	58
13. Letter Series	R	45	11	-16	-11	-16	-10	60	10	65	53	35	-09	11	19	-05	42	02	64
14. Word Group	R	36	01	31	-09	-04	03	05	-04	23	57	35	30	03	-13	19	18	16	64
15. Number Ser.	R	39	27	02	-05	07	-06	42	03	50	36	37	-18	12	20	09	31	02	46
16. Raven's P.M.	R	47	16	-08	27	04	18	14	01	38	58	24	20	02	03	-00	23	01	49
17. Pict.Number	Ma	21	03	-04	04	10	62	-02	-18	48	23	21	11	-04	-16	47	-05	03	36
18. Object-Number	Ma	21	04	-02	05	-02	62	-04	-12	46	20	30	-14	16	09	50	-01	-01	43
% Variance		14	08	06	06	05	06	05	01	51	19	11	07	05	05	04	04	01	56
Coeff. of Congruent		93	79	91	91	72	86	95	44		95	85	97	78	81	83	76	48	

TABLE 6

Factor Matrices for Grade 8 Rotated to Match Target Matrix 1

			Grade 8 Canadian									Grade 8 Filipino								
	Test		R 1	A 2	V 3	S 4	N 5	M 6	O 7	8	h^2	R 1	A 2	V 3	S 4	N 5	M 6	O 7	8	h^2
1.	Verbal Mean	V	43	35	43	13	20	12	09	-06	57	34	49	24	-03	32	-08	09	-05	53
2.	Vocabulary	V	67	08	59	02	14	10	01	-16	85	33	21	50	-05	08	-02	-16	-01	44
3.	Word End	F	30	28	33	01	-15	37	-20	14	49	16	53	08	-14	10	35	06	07	46
4.	Word Beg.	F	18	48	44	04	-01	00	-24	18	55	16	31	08	-27	04	42	14	-02	40
5.	Spatial Rel.	Sp	58	03	-04	64	00	-01	-09	02	75	51	02	00	47	09	-15	01	-02	51
6.	Card Rot.	Sp	50	07	-02	64	09	07	-18	-02	71	56	09	-16	70	21	15	-09	-09	91
7.	Ident. Picture	P	26	38	-11	19	-05	-08	16	21	34	35	55	-10	14	02	01	23	20	55
8.	Maze Tracing	Sp	35	19	01	33	-32	00	-05	31	47	28	30	-17	40	-27	10	05	38	58
9.	Finding A's	P	19	14	-23	07	-17	10	26	-17	25	06	48	02	04	20	33	-11	02	39
10.	Arithmetic	N,R	37	29	17	11	05	-05	04	06	28	35	41	23	00	14	-21	-12	07	43
11.	Subtn. Multn	N	-20	53	10	-17	56	08	-09	-17	72	15	53	14	11	37	-10	-07	-01	48
12.	Division	N	-20	54	-06	05	50	06	01	-11	56	23	52	37	09	29	-36	-11	06	70
13.	Letter Series	R	37	29	-15	-18	00	-08	60	07	65	50	17	-09	-14	09	02	56	04	62
14.	Word Group	R	44	16	29	01	-21	-04	05	16	38	49	20	27	14	20	-06	03	-09	43
15.	Number Series	R	50	08	01	-07	15	30	34	-18	52	46	07	-04	-05	02	-09	44	-05	42
16.	Raven's P.M.	R	49	24	16	00	-35	-09	24	30	60	50	33	20	17	-24	-07	06	29	59
17.	Pict. Number	M	16	19	-10	07	27	33	07	-15	29	08	15	-02	02	-23	62	-15	14	51
18.	Object-Number	M	17	26	-12	00	-02	47	09	07	35	00	33	08	14	-09	48	-12	13	40
%	Variance		15	09	06	06	06	04	04	03	52	12	13	04	06	04	07	04	02	52
Congruence Coeff.			93	91	91	91	76	83	83	57		92	92	79	92	70	80	87	52	

TABLE 7

Means and Standard Deviations of Estimated Factor Scores

	Factor						
	1	2	3	4	5	6	7
	R	A	V	S	N	M	O
Grade 6 Means							
Canadian	.02	-.92	-.13	.13	-.12	-.12	.05
Filipino	-.26	.82	-.12	-.16	.28	-.22	.14
Difference	.28*	-1.74*	-.01	.29*	-.30*	.10	-.09
Grade 8 Means							
Canadian	.90	-.49	.49	.03	-.20	.12	.14
Filipino	-.64	.35	-.22	-.04	.28	.20	-.30
Difference	1.54*	-.84*	.71*	.07	-.48*	-.08	.42*
Grade 6 S. D.'s							
Canadian	.58	.99	.61	.67	.46	.65	.64
Filipino	.84	1.02	.81	.76	.83	.63	.73
Grade 8 S. D's							
Canadian	1.12	.46	.80	.78	.54	.79	.65
Filipino	.88	.86	.62	.80	.83	.86	.77

* Different at .05 level of significance.

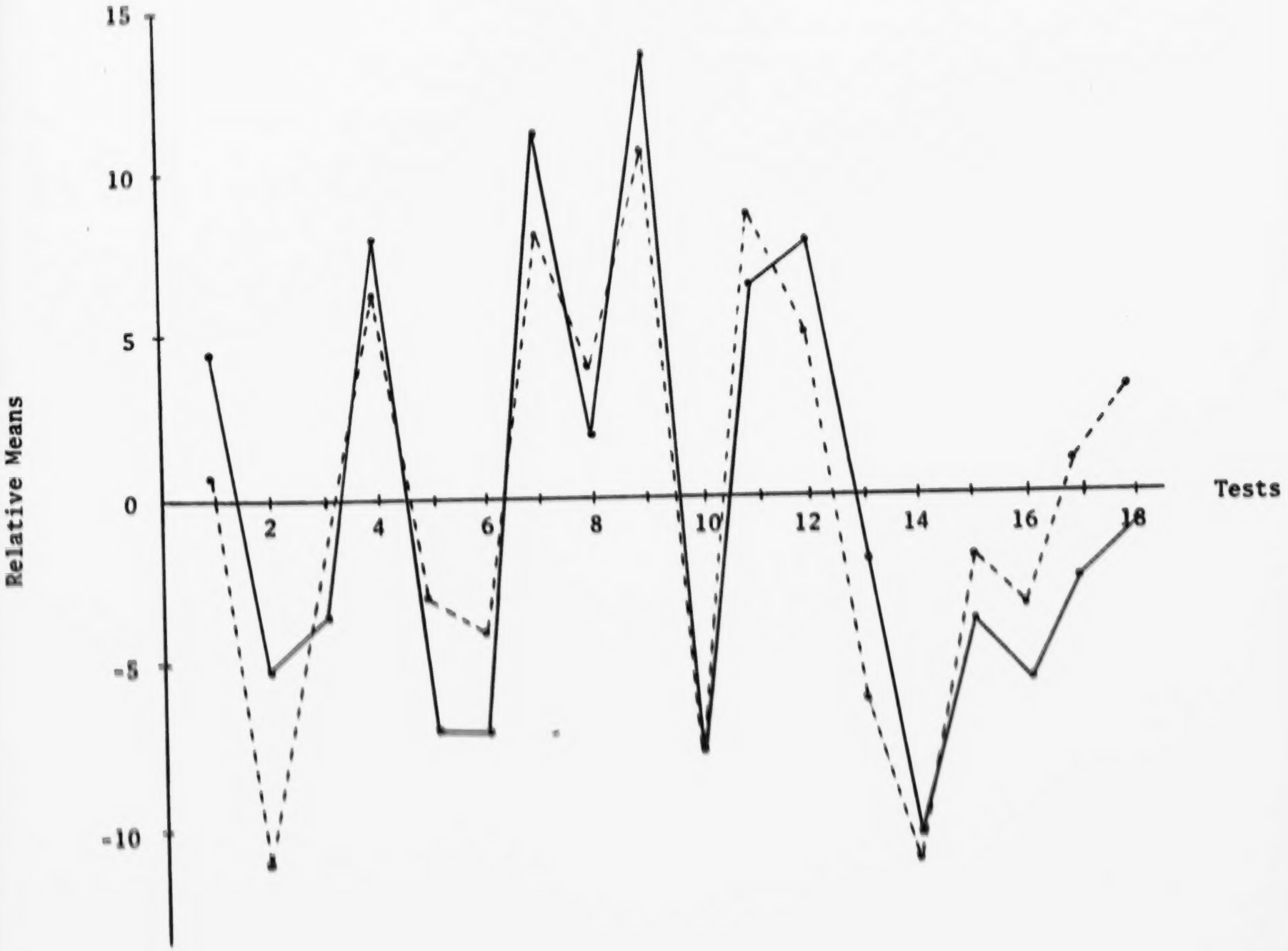

Figure 1. Profiles of Relative Means for Filipino Groups.

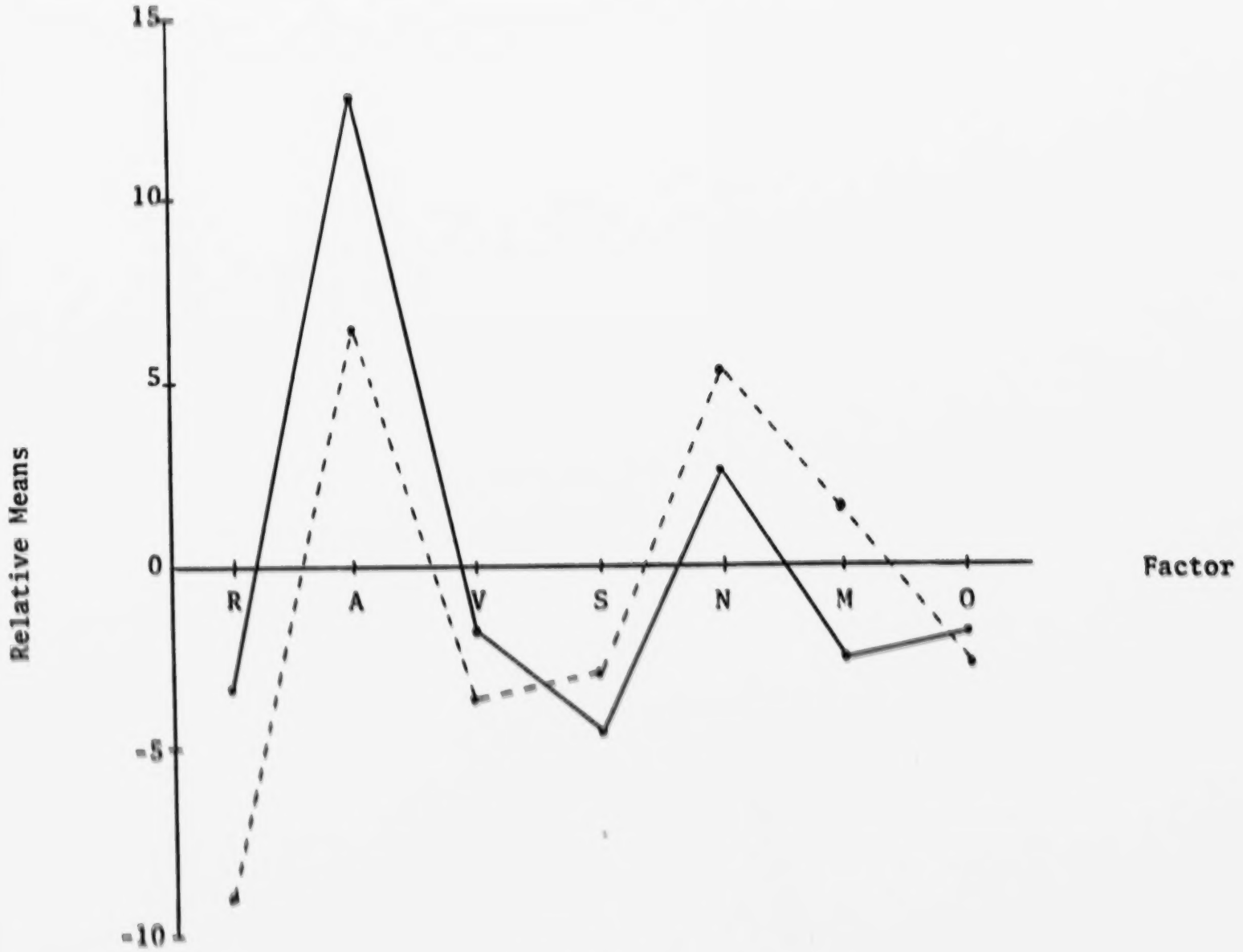

Figure 2. Profiles of Relative Factor Means for Filipino Groups.